ANEURYSM OF COMMON CAROTID ARTERY IN THE NECK
FOLLOWING PARTIAL LIGATION FOR AN INTRACRANIAL ANEURYSM

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There is still considerable controversy regarding the treatment of aneurysms of the circle of Willis. Nevertheless most surgeons who have had experience in this field employ carotid ligation, either as a definitive method or as an adjunct to intracranial procedures. It is not our purpose at this time to discuss the relative merits of the various methods of treatment of intracranial aneurysms. The following case illustrates an unusual complication of ligation of the common carotid in the neck for an aneurysm of the circle of Willis.

CASE REPORT

H.L., a married white woman of 25, collapsed while walking in the street. She was taken by ambulance to the emergency ward of a city hospital. On admission, she was in deep stupor, and there was a hematoma in the right occipital region. The patient improved during the next few hours and she was transferred to our care.

Examination about 24 hours later disclosed a thin woman in stupor. She could be roused with ease. She was confused and disoriented. The neck was moderately rigid, and there was a positive right Babinski.

Course. During the next 3 days the patient became more alert and less confused. The cerebrospinal fluid was grossly bloody. The initial pressure was 320 mm. On the 7th day ptosis of the right upper eyelid developed. Two days later there was a complete internal and external right 3rd nerve paralysis. The right pupil did not react to light and was widely dilated. The fundi showed beginning papilledema.

Fig. 1. Angiogram showing berry aneurysm springing from the internal carotid artery just above its junction with the posterior communicating artery.
Daily digital compression of the common carotid artery was started. The patient complained of light-headedness at first, but after a few days she could tolerate 10 minutes of compression without symptoms. At this time right carotid angiography was done with 35 per cent didodrast by the percutaneous technique. This disclosed a berry aneurysm (Fig. 1) springing from the internal carotid artery just above the origin of the posterior communicating artery.

**Operation.** A few days later the right common carotid artery was exposed with the use of local anesthesia. Occlusion of the artery with a rubber tape caused a slight weakness in the left upper and lower extremities. The common carotid artery was therefore partially occluded with a heavy braided silk ligature. The lumen was probably reduced to one-fourth or one-fifth of its original size.

**Course.** Following this procedure the patient improved rapidly. Within a few days the ptosis was much less evident, and the internal rectus palsy had also diminished. She was permitted to go home 3 weeks after the incomplete ligation. We had planned to re-admit her at a later date for ligation of the internal carotid artery.

About 2 months after the partial ligation, the patient noted a small swelling in her neck at the operative site. Examination at this time disclosed a small mass, about 2 cm. in diameter, under the operative scar. A thrill and a bruit were present. There was slight weakness of the levator of the right lid, and an almost complete paralysis of the right superior rectus. The right pupil was slightly larger than the left and reacted to light sluggishly. The fundi were normal.

The patient was advised to re-enter the hospital; however, she postponed this for about 3 months. At this time the pulsating mass in the neck had increased in size slightly. The patient now tolerated compression above and below the mass in the neck without symptoms.

**2nd Operation.** On May 6, 1953, about 5 months after the initial partial ligation, under general endotracheal anesthesia the common carotid artery was exposed below the mass. The common carotid was imbricated with three arterial sutures, then doubly ligated with braided silk and divided. The aneurysm in the neck was then dissected from the surrounding tissues. The internal and external carotid arteries were then doubly ligated and divided. The specimen (Fig. 2) on removal measured 2.5×2×1.5 cm. Fresh blood clot was present in the aneurysmal sac.

**Course.** The patient improved rapidly following this procedure and she was discharged from the hospital 10 days later. She has remained well.

**COMMENT**

According to Halsted,\(^1\) Antyllus, one of the great surgical figures of antiquity, was the first to describe a method for the treatment of peripheral aneurysm. Antyllus advised isolating the aneurysm between ligatures, then opening the sac with a small incision to empty its contents. This method remained in vogue until John Hunter (1728–93) advocated ligation high up in healthy tissues by a single ligature as the best method for the treatment of aneurysms.

Modern management of an aneurysm depends on its location, size, duration, etiology (spontaneous or traumatic), and age and condition of the patient. Pratt\(^7\) listed the following methods: (1) Excision with end-to-end anastomosis. (2) Venous transplant. (3) Obliteration operation (Matas). (4) Occlusion by proximal ligation.

To the above, one must, of course, add proximal and distal ligation with excision of the sac. This was the technique used in our case. Aneurysms of the common or of the internal carotid artery in the neck present a special problem because of the serious sequelae that may accompany the occlusion of these vessels.

Referring to carotid artery ligation, Matas (1909) stated that the possible occurrence of cerebral disturbances "has invested the technically simple operation... with a gravity and anxiety that are associated with few other ligation." Reid set forth certain principles governing the ligation of large arteries. He advocated that:

(1) The size of the ligature should increase in direct proportion to the size of the artery; (2) the ligature should be tied during temporary distal and proximal closure of the artery to remove intra-arterial tension and thus avoid fracture of the media and intima; (3) the tension used in tying the ligature should be just enough to occlude the lumen; and (4) the ligature material should not be subject to stretch or dissolution. Reid cautioned against the use of partially occluding or crushing ligatures. When partial occlusion is indicated, he advocated the use of a flattened metallic band.

Our patient demonstrates an unusual complication of the partial ligation of a large artery with a round ligature. The mechanism by which the aneurysm developed seems simple enough. The media and intima were no doubt fractured when the ligature was tied. When symptoms and signs of cerebral ischemia developed, the ligature was loosened, resulting in a partial occlusion of the common carotid artery. With partial occlusion, atrophy of the injured arterial wall occurred with the development of a saccular dilatation of the lumen. In time the sac slowly enlarged forming a pulsating tumor mass at the site of ligation.

This case demonstrates the danger of partial occlusion of a large artery with a round ligature. Metal bands, special clamps and bands of fascia have been advocated for partial occlusion of the carotid vessel. However, in our experience, complications have occurred following the use of these methods also. In patients who tolerate total occlusion of the common carotid artery, we prefer to doubly ligate the vessel and divide it between the ligatures. The artery is plicated before the ligatures are tied according to the method of Poppen. When partial ligation is indicated, it is probably best to reduce the lumen of the artery by wrapping with fascia and maintaining the narrowed lumen by suturing the fascia in such a way as to form a tunnel at least one-half inch wide for the vessel to pass through. Metal bands and clamps left in place increase the hazard of infection with possible slough of the vessel wall. A simple and safe method for the gradual occlusion of large arteries has not yet been devised.

REFERENCES

It is recognized that the prone position is not physiologic for operations and yet it is desirable to perform certain neurosurgical procedures in this position.

 Provision must be made for the proper expansion of the chest and abdomen in order to avoid interference with respiration.

 Several methods for accomplishing this are in use. One consists of the use of shoulder supports attached to the head of the operating table. Another consists of the placement of sandbags beneath either shoulder. A third method is the use of a rolled pillow on either side of the body extending from the shoulder down to and including the crest of the ilium. A disadvantage of the latter method is the fact that it is difficult to maintain the pillows evenly so that the back is horizontal.

 A foam rubber mattress seemed to be a possible solution to this problem. A window was cut in the mattress so that the patient's chest and abdomen could partially protrude through the opening thereby allowing normal respiratory movements of the chest and abdomen. In addition, it was found that the center piece could be used as a comfortable head rest. The mattress has been upholstered with a non-conducting cover so that it can be used in all situations where explosive anesthetic mixtures are used.

 Uses. It is used on top of the standard operating table mattress and has been used for lumbar laminectomies, thoracic laminectomies, cerebellar procedures, and ventriculograms.